

A Summary of the 42-year Follow-up of Vietnam Prisoners of War: Mortality and Morbidity Findings

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It has been more than forty years since the last of the 662 US Military Prisoners of War (POW) were repatriated from Vietnam, 566 of whom came home together in the spring of 1973 as part of Operation Homecoming (O/H). The Department of Defense established a voluntary medical follow-up program in order to document those medical and psychological effects of captivity observed within the first five years following repatriation. The Army and the Air Force discontinued their programs as planned in 1978, but the Navy continued its' repatriate program and added a comparison group of combat experienced aviators in order to identify the more subtle immediate effects of captivity. Army and Air Force Vietnam repatriates were subsequently invited to join the Navy program and members of all services continue to be eligible for annual voluntary medical follow-up at the Robert E. Mitchell Center for POW Studies.

Repatriate health at the time of repatriation for those military personnel who participated in O/H (Thirteenth Air Force, 1973), as documented in the Initial Medical Evaluation Form (Center for Prisoner of War Studies, 1972), has been extensively summarized. The proceedings from three joint medical meetings held within the first five years following repatriation summarized the service-specific findings, which included effects of captivity on the POW's family (Spaulding, 1976, US Army, 1977 and Wetzler, 1979). In addition, a comprehensive listing of the specific diagnoses observed at the time of repatriation, unique captivity and torture experiences and risk factors associated with diagnoses aggregated within International Classification of Diseases (ICD) categories (National Center for Health Statistics, 2010) have been reported separately for the Navy (Berg and Richlin, 1977a; Raza et. al, 2016a), Army (Berg and Richlin, 1977b; Raza et. al, 2016b), Marine Corps (Berg and Richlin, 1977c; Raza et. al, 2016c), and Air Force (Raza et.al, 2017a). An analysis of the combined data addressing similarities and difference between the services with respect to the predictive strength of risk factors (age at time of capture, length of captivity, length of solitary confinement, torture severity and subjective medical complaints during captivity) has also been recently reported (Raza et.al, 2017b). To date, there has been no report addressing the Vietnam repatriate survival/mortality data and only one publication has addressed the long-term health consequences observed in this group.

A subset of the Navy repatriates (51%, representing only 11% of all Vietnam repatriates) and 40% of the comparison group (CG) were studied to determine the effects of captivity on 235 three-digit ICD diagnoses (Nice et. al, 1996). Subjects were selected if they had received voluntary follow-up in 1979 (six years post-repatriation) and 1993 (twenty years post-repatriation). Repatriates demonstrated an increased relative risk for conditions involving the peripheral nervous system (especially mononeuritis of the upper extremities, ICD 354), joint disorders (ICD 710-719) and disorders of the back (ICD 720-724). The groups were not different with respect to either the most prevalent conditions (i.e., hearing problems, benign prostatic hypertrophy or chronic obstructive pulmonary disease) or those conditions selected due to special clinical interest (i.e., peptic ulcer, hypertension, diabetes mellitus or adjustment disorder). Posttraumatic stress disorder was not analyzed as a subset of the ICD 309 code. No subsequent analysis of morbidity has been reported in the past twenty years and the study by Nice and colleagues did not address Navy repatriate survival/mortality. To be sure, however, several past epidemiologic studies have addressed the mortality and morbidity findings among World War II and Korean War repatriates.

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World War II and Korean War Mortality

The initial study regarding survival/mortality among World War II repatriates included 1,850 Pacific Theater personnel and 1,804 European Theater personnel (Cohen and Cooper, 1954). The captivity of these two groups varied on many levels, to include average length of captivity (38 months of captivity with 86% more than 3 years versus 10 months of captivity with 84% less than 18 months, respectively) and death rate during captivity (34% versus 1%, respectively). Of these 3,654 repatriates, 11% were Officers, 15% had more than a high school education and 85% unmarried. Standardized mortality ratios (SMR) using the 1949 age-adjusted US male life tables were calculated for each of the first six years following repatriation. During this brief follow-up, Pacific Theater SMR declined from 5.44 to 2.23, reflecting a significantly elevated risk of death relative to their civilian counterparts, with special emphasis on deaths due to tuberculosis and accidents. No special cause of death was found among European Theater repatriates, where SMR declined from 1.27 to 0.80 during the six years following their repatriation.

As the large-scale, carefully-designed epidemiologic study conducted by the Veterans Administration continued, repatriates from the Korean War and members of three comparison groups were added and the number of World War II repatriates was increased. Consequently, Nefzger (1970) was able to summarize the survival/mortality of 9,501 repatriates (Pacific Theater = 3,162; European Theater = 2,380 and Korea = 3,959), as well as 9,657 comparison group members (Pacific Theater = 2,192; European Theater = 3,512 and Korea = 3,953). Detailed information regarding length of captivity, death age and officer/enlisted status were not provided, but this study summarized the first 20 years for the World War II repatriates and the first 12 years for the repatriates from the Korean War. The median age at the time of repatriation was as follows: World War II "25-29"; Korean War "<25." By the end of 1965, the mortality rate for the repatriates (6.1%) was significantly greater than that of the comparison group (5.2%) as measured by relative risk (1.18, 95% confidence interval = 1.05 to 1.33). This difference was attributable to higher death rates in both Pacific Theater (RR = 1.34; 95% confidence interval = 1.12 to 1.61) and Korean War (RR = 1.29; 95% confidence interval = 1.01 to 1.64) repatriates. For the European Theater repatriates, the SMR was actually less than their matched comparison group (RR = 0.80; 95% confidence interval = 0.65 to 0.99). For all repatriate groups, there was an increase in deaths related to trauma/accidents, while tuberculosis and cirrhosis were also noted among the World War II repatriates.

Keehn (1980) continued the epidemiologic follow-up study conducted by the Veterans Administration an additional ten years (by the end of 1975), representing follow-up periods of 30 years and 22 years for the World War II and Korean War repatriates, respectively. At that point, the mortality rate for the repatriates had increased to 14.6% (from 6.1%) while that of the comparison group had increased to 13.6% (from 5.2%). This difference was not statistically significant (RR = 1.06; 95% confidence interval = 0.99 to 1.14). When compared to their specific comparison group, there was an increased risk of death during the first 9 years following repatriation for the Pacific Theater repatriates and for the first 13 years following repatriation for the Korean War repatriates. At no time during the follow-up period were European Theater repatriates at an increased risk of death relative to their comparison group. For all six groups, the risk of death among officers was less than that of enlisted personnel (RR averages: 0.66 for repatriates and 0.69 for comparison groups).

World War II and Korean War Morbidity

The previously mentioned mortality study conducted by Cohen and Cooper (1954) also included morbidity data from the first years of medical follow-up of 3654 World War II repatriates as well as 4037 members of a carefully selected comparison group. During that time period, admission rate to Veterans Administration hospitals was more than three times higher in Pacific Theater repatriates, while the admission rate to service hospitals were equivalent (Pacific Theater = 0.99 per 100 man-years; European Theater = 0.86 per 100 man-years). Using a 36-category grouping of ICD diagnostic codes, Pacific Theater repatriates had approximately 3.5 times more categorical diagnoses than European Theater repatriates and 7 times more categorical diagnoses than their comparison group. The number of categorical diagnoses among European Theater repatriates was only twice that of their comparison group, the two comparison groups were equivalent.

The next summary of the somatic and psychiatric sequelae of captivity compared 964 World War II (Pacific Theater = 648; European Theater = 316) and 577 Korean War repatriates to a total of 1,327 era-matched control subjects. Morbidity was measured using number of hospital admission, self-report subjective symptoms, and Veterans Administration disability ratings. Estimated weight loss (Pacific Theater) and the number of subjective captivity-related medical problems were the best predictors of long-term morbidity within the repatriate groups. When compared to era-matched controls, European Theater repatriates demonstrated a reduction of somatic sequelae, but a persistence of psychiatric sequelae. Psychiatric and somatic sequelae were consistently greater among Pacific Theater repatriates, while the observed sequelae among Korean War repatriates were mainly psychiatric. Admission rates were primarily attributable to respiratory (pulmonary tuberculosis) and digestive disorders, infections (parasitic disease) and psychiatric illness (predominately “anxiety reactions”). Subjective symptoms, as measured by the Cornell Medical Index (CMI), were higher in Pacific Theater and Korean War repatriates relative to controls, while European Theater repatriates did not differ from their controls. The CMI scores of the three control groups were equivalent. The rank ordering of disability among repatriates was as follows: Pacific Theater > Korean War > European Theater. Repatriate disability was consistently higher among repatriates than controls, especially for psychiatric illnesses. In this study, specific disability associated with “anxiety reaction” was nearly five times more common among repatriates than controls.

The Veterans Administration medical examination survey (Page, 1992) received complete documentation from 1,067 of 4,162 eligible participants (26%). Although the 41% of the eligible repatriates provided complete data, only 9% (184 of 1,981) completed this epidemiologic survey. This response rate resulted in the author taking a more conservative approach to data analysis and interpretation than originally planned, as “the low response rates raise justifiable concerns about potential nonresponse bias.” It is nevertheless important to review the diagnostic data that was aggregated to the three-digit ICD code level, as well as the total number of diagnoses and specific psychiatric conditions among the repatriates (Pacific Theater = 250; European Theater = 142 and Korean War = 408) and their controls (Pacific Theater = 54; European Theater = 27 and Korean War = 103). All three groups had ICD 719 (joint disease) list among their most prevalent conditions (top 15% of 60 diagnoses). The Nonspecific General Symptoms category (i.e., sleep disturbance, fatigue/malaise, fever, alterations of consciousness) was listed as one of the top two diagnostic codes in all three repatriate groups. Anxiety disorders (ICD 300) were in consistently listed within the top three categories among the repatriates, while “Non-specified Abuse of Drugs” (ICD305) was the most prevalent category for the controls from Pacific Theater and Korean War control. Surprisingly, abnormal findings from the examination of blood (ICD 790) was consistently within the top four categories for controls, but did not appear on any repatriate listing of the most prevalent condition. The Korean War repatriates were more likely than their controls to have conditions in 10 of the 22 ICD categories reported in this study, while both World War II repatriate groups differed from their control on only 4 of those categories. Collapsing across groups, the lifetime prevalence data revealed a 40% increase in number of separate diagnoses among the repatriates (64.7 diagnoses versus 45.9 diagnoses). Using the Structured Clinical Interview for DSM-III-R (SCID), lifetime repatriate PTSD prevalence was greatest among the Korean War (41%) and least in the European Theater (23%) and all three repatriate groups were more likely to higher SCID lifetime prevalence of PTSD than their matched control group. Overall, the lifetime prevalence of SCID-based PTSD was 60% higher among repatriates (35.3% versus 22.1%). In addition, the overall mean score on the Beck Depression Inventory was 73% higher among the repatriates (25.2 versus 14.6).

Summary

The purpose of this article is to report on, for the first time ever, not only the survival/mortality of the USN (USMC) RPWs, but also on the USAF RPWs, USA RPWs, and USN CGs from the Vietnam conflict. Another purpose is to report and analyze the morbidity at the 42-year milestone for each of these groups. Unlike the Nice et.al (1996) study with a “controlled” sample size, we’ll look at the entire REMC cohort. Based on our previous results regarding ICD diagnoses at the time of repatriation and the predictors of long-term resilience/health, as well the morbidity/mortal findings from WWII and Korea, we propose the following hypotheses:

H1 (Mortality): The survival rate for the USN CG will be greater than that for the other four groups due to a general “captivity” factor. Differences between the various captivity experiences would result in a lower survival rate among the USA RPWs and Non-OH repatriates, while the two groups of predominantly aviator repatriates (USN/USMC and USAF) held captive in North Vietnam would show similar survival rates.

H2 (Mortality): Among the OH repatriates, age at time of capture, length of captivity, length of solitary confinement, and torture severity will each contribute significantly to the prediction of survival.

H3 (Morbidity): Within the two groups with the longest REMC participation and greatest number of annual examinations, the USN/USMC repatriates will be more likely to receive diagnoses than the CG on most of the ICD categories, especially Mental disorders (PTSD related), Neurological disorders (mononeuritis) and Injuries (vertebral fractures due to shoot down/ejection).

H4 (Morbidity): Among the repatriates, the morbidity rates will be similar to the mortality rates with the USN/USMC and USAF repatriates being most similar. The USA repatriates will show the most morbidity across ICD categories, especially for mental disorders (PTSD). We also predict that the prevalence of ICD categorical diagnoses will be lower in officers than in enlisted personnel due to more stringent medical standards associated with their aviation duty.

H5 (Morbidity): Finally, we predict that the prevalence of long-term medical problems will be greater among Vietnam repatriates than among WWII or Korean War repatriates due to primarily to the longer duration of their captivity. We also predict that cohort differences will contribute to lower morbidity within the Vietnam-era CG and in the control groups from WWII and Korea.

Methods

We used all available data from our (REMC) longitudinal database of voluntary annual evaluations (aka physical exams). These evaluations included mental and physical diagnoses, which were made by providers from the REMC, Veteran’s Administration; commercial medical sector, and coded in accordance with ICD9-CM. The database originated in 1973 with only the USN/USMC RPWs (n=169). The USN Comparison Group (CG) started in 1978 (n=123), followed by the USAF RPWs in 1993 (n=251), and the USA RPWs in 1997 (n=65) yielding 485 RPWs (73%) and 123 USN CGs (89%). There were 8579 physical exams (PE), over the 42 years, which averaged 14 PEs and 29 diagnoses (Dx) per veteran. Each of the services’ contribution to the average was: USN (USMC) #PE = 22 (12), #Dx = 35(16), USAF #PE = 8(6), #Dx=25(14), and the USA #PE = 5(5), #Dx=21(13).

Consistent with our prior studies, we determined the diagnosis frequency at the ICD9-CM Category level (i.e.; 3-digits). To accurately account for code changes and new diagnoses, we rectified the early code for Sleep Apnea (780 Apnea) to the current ICD9-CM Code 327. Because of the intense interest in Post-Traumatic Stress Disorder (PTSD), we went to the 5-digit diagnosis level to separate PTSD (309.81) from Adjustment Disorders (309). We then listed the top 5 diagnoses per ICD9-CM Category for each group. Because of clinical interest, we chose specific diagnoses and computed Odds Ratios (95% CI). As with our prior studies, we chose the top diagnoses for each group and presented them in a table for reference.

All dates of death in our REMC longitudinal database were individually verified and cataloged in 5-year increments by group (USN (USMC), USAF, USA; USN CG; non-OH).

Results

Demographics

The 8,579 annual physical examinations summarized in the Morbidity section of this report were collected as part of forty-two year voluntary medical follow-up program for Vietnam-era military repatriates (88% of whom were officers during captivity). A group of 138 combat-experienced Naval aviator officers, each matched with the 138 Naval aviator (officer) repatriates, were also included. Unlike carefully controlled prospective studies or extremely large epidemiological studies, the frequency and recency of REMC examinations were primarily dependent on the patient's schedule. In the initial years following repatriation, most patients were on active duty, still participating in duty involving flight and subject to deployments. Following retirement from active duty and subsequent to civilian retirement, other factors contribute to their less than optimal participation. As shown in the far left portion of Table 1, the average age of the Comparison Group member at the time of naval aviator repatriate shoot down was 30.9 years (Table 1). The middle portion of Table 1 shows means for age at time of capture, length of captivity (months) and length of solitary confinement for the military repatriates who have received REMC medical follow-up examinations. Specific information regarding solitary confinement and torture were only collected as part of O/H and not available for the non-O/H repatriates. Morbidity data, based annual REMC examinations, were available for 89% of the Comparison Group and for 485 of the 662 service members who were held in Vietnam as prisoners of war (73%). Mortality data, through 12/31/2015, were available for the entire sample (138 Comparison Group, 566 O/H repatriates and 96 non-O/H repatriates).

Mortality

The forty-two year survival rate ranged from 70% (Comparison Group) to 75% (USA Repatriates), with a grand average survival rate of 72% (Table 2). The distribution of group rates did not differ from this mean ($X^2 = 0.96$, $df = 4$, $p = 0.9158$) and the differences in repatriate survival rates over time were statistically insignificant (Kaplan-Meier Log Rank $X^2 = 2.033$, $df = 3$, $p = 0.565$) from each other. Also, the survival rates of officers and enlisted repatriates did not differ (72% Officers; 73% Enlisted; Kaplan-Meier Log Rank $X^2 = 0.014$, $df = 1$). Among the 138 matched naval aviator pairs (Table 3), both members of 72 pairs were alive and both members of 16 pairs were deceased. An identical numbers of Navy repatriates and comparison group members were alive ($n = 97$, 70%) of each group at the end of 2015. The average age at time of death was 67.1 years (± 14.3 years) for the comparison group and 70.6 years (± 15.2 years) for the Navy repatriates ($t = -1.07$, $df = 40$, $p = 0.291$).

Cox regression survival analysis was conducted to assess the predicative significance of four risk factors (age at time of capture, months of captivity, weeks of solitary confinement and torture severity) in predicting mortality/survival. A logarithmic transformation was performed to reduce solitary confinement skewness and length of captivity was analyzed following a median split due that variables' bimodal distribution. These adjustments did not alter the results and only the unadjusted results are presented in Table 4. Repatriate age at the time of capture was significantly predictive of survival rate, with repatriates who were older at the time of capture being more likely to die within this 42 year period of follow-up ($\text{Exp(B)} = 1.112$, $p < 0.001$; an 11% increase in risk of death for each year since repatriation). Neither lengths of captivity and solitary nor torture severity were predicative of survival.

Morbidity

A listing of the five most frequent diagnoses within each of the sixteen ICD categories (neurological disorders and disorders of special senses are listed separately) for each group is presented in Tables 5a and 5b. For some ICD categories the most prevalent three-digit code is present in nearly every patient (special senses – SEN), while in others the most prevalent three-digit code is very rarely present (congenital disorders CON). In order to facilitate group comparisons, Tables 6a and 6b list the 30 most prevalent conditions within each group, regardless of ICD category. For example, PTSD was the fourth

most prevalent diagnosis among Army repatriates, but PTSD was not among the top 30 most prevalent diagnoses among the comparison group. Similarly, hearing loss was consistently in the top three most prevalent diagnoses in each of the four groups.

Group differences in the prevalence of ICD Categorical diagnoses were evaluated using Odds Ratios (with significant differences defined by 95% confidence intervals) and those results are presented in Table 7 (along with the prevalence values by Category and group). When compared to the comparison group, the USN (USMC) repatriates were 2-3 times more likely to have mental disorders, disorders of the nervous system and injuries/poisoning than the comparison group. There was no diagnostic category where the comparison group was more likely to have diagnoses than the USN (USMC) group. However, when compared with all repatriates, the comparison group was significantly more likely to have infectious or parasitic diseases, neoplasms, genitourinary disorders and ill-defined conditions and significantly less likely to have been diagnosed with mental disorders and disorders of the nervous system.

The USAF and USN (USMC) groups were primarily comprised of aviator officers who were held prisoner in North Vietnam, tortured regularly and often placed in solitary confinement. Despite these similarities, USN (USMC) repatriates were significantly more likely to have received diagnoses in ten of the 16 ICD categories during the follow-up period. There was no category where the USAF group was significantly more likely to have received a diagnosis than the USN (USMC) group. When the USA group was compared to the USN (USMC) group, our analyses revealed that Army repatriates were more than twice as likely to have received a mental disorder diagnosis, while USN (USMC) repatriates were significantly more likely to have received diagnoses in 11 of the 16 categories.

Although, as reported above, there was no difference in the mortality/survival rate between officer and enlisted personnel, we examined the differences in categorical ICD diagnostic prevalence using this variable (Table 8). The odds of receiving a diagnosis were significantly greater among officers for seven of the categories, but enlisted patients were nearly three times as likely to have been diagnosed with a mental disorder at some time during the follow-up period.

Our final morbidity analysis focused on twenty-one specific diagnoses that were selected based on specific clinical interests. Although there were no significant group differences in the prevalence of either malignant neoplasms of the prostate or essential hypertension, significant differences were observed on all of the other diagnoses. For the USN (USMC)/CG comparison, the repatriates were more than nine times as likely to have been diagnosed with PTSD (309p) and mononeuritis of the upper limb (354), and 2-3 times as likely to have been diagnosed with vertebral fractures (805), other skin/subcutaneous disorders (709) and mononeuritis of the lower limb (355). The odds for dermatophytosis (110), obesity (278), alcohol dependence (303) and cardiac dysrhythmias (427) were significantly higher for the comparison group than the USN (USMC) group.

Although sleep apnea (327) was significantly more likely in the USAF group than the USN (USMC) group, USN (USMC) repatriates were significantly more likely to have received seven of the other specific diagnoses of clinical interest. Army repatriates were significantly more likely to have been diagnosed with PTSD (309p) and mononeuritis of the lower limb (355), than either of the other repatriate groups and more than twice as likely as USN (USMC) repatriates to have been diagnosed with Diabetes Mellitus (250). When compared to the other groups, cardiac dysrhythmias (427), inguinal hernia (550), benign prostatic hypertrophy (600), osteoarthritis (715) and spondylosis (721) were significantly less common.

Discussion

This study has provided an initial glimpse of the morbidity and mortality data collected by the Robert E. Mitchell Center since 1973. In so doing, we have summarized the results of more than 8,500 annual physical examinations (person-years) obtained from 608 patients. We have also tabulated the

mortality/survival of an additional 192 former service members (100% of Vietnam-era repatriates and comparison group members). This clinical program is the only one of its' kind within the Department of Defense. On average, patients have had 14 annual examinations and many still come to the Center on a regular basis. This clinical follow-up program has allowed Center staff to address patients' requests to make treatment recommendations to their primary care providers, or to provide service-connected verification to disability raters at the Veterans Administration based on our long-term follow-up and awareness of medical problems that began during captivity.

Preliminary answers are available for each of the five study hypotheses. Contrary to our prediction, the CG survival rate was not greater than the four repatriate groups. This was unexpected given the lengthy captivity, torture and captivity-related medical problems associated with captivity. At the ten year point, only 2% of the repatriates were deceased. The death rate increased to 4% within the twenty years following repatriation and to 10% by the 30 year point. Each of these mortality rates were less than those previously reported for WWII Pacific Theater and Korea repatriates, despite the Vietnam repatriate's much longer imprisonment. In addition, the relative mortality risk for the Vietnam RPW comparison to the CG was insignificant. Although it is tempting to attribute the group differences to the fact that the Vietnam group was largely comprised of aviator officers, there was no mortality difference between officers and enlisted and the overall death rate was below expectation. Specifically, in 1973 at the time of repatriation, the average additional life expectancy of 34-year-old men was 37 years. According to this actuarial statistic, a mortality rate of 50% was predicted by the year 2010 and 72% were alive by the end of 2015. Of course these findings cannot rule out unique cause of death among the Vietnam repatriates, nor do they address the relationship between Vietnam repatriate mortality and captivity-related risk factors.

We also predicted that captivity-related risk would be reliably related to Vietnam repatriate mortality. Neither torture severity, nor length of solitary confinement, nor length of captivity were predictive once age at the time of capture was included in the equation. This finding does not suggest the relevancy of age alone, but also reflects the significant correlations between the four risk variables. It would have been counterintuitive to find no relationship between age and mortality and we remain interested in investigating the possible relationship between captivity-related medical problems and mortality.

With regards to morbidity differences between the CG and the USN/USMC repatriates, our specific hypotheses were confirmed regarding Mental disorders (PTSD related), Neurological disorders (mononeuritis) and Injuries (vertebral fractures due to shoot down/ejection) were confirmed. For each of these ICD categories, repatriates were 2-3 times as likely to have received diagnoses. This finding was supported and further elaborated for several specific diagnoses within the categories (PTSD, upper limb mononeuritis, and vertebral fractures). Our prediction that USN/USMC repatriates would show considerably more morbidity than the CG was not supported at the level of ICD categories as there were group differences on thirteen of the categories. USN/USMC repatriates were not, in general, more likely to receive more diagnoses than CG patients (holding constant age and number of examinations). The relationship between these morbidity results and captivity-related risk factors merits further study, as do those four specific diagnoses that were more likely in the CG than in the USN/USMC repatriates.

The prevalence rates for the eight most common ICD categories were lower among the repatriates than in comparison group, significantly so for genitourinary disorders (e.g. benign prostatic hypertrophy) and ill-defined conditions. Only twice were prevalence rates higher among repatriates: mental disorders (e.g. PTSD) and conditions involving the nervous system (e.g. mononeuritis). Contrary to our predictions, there was a striking dissimilarity between USN/USMC and USAF repatriates, despite similar age, location of captivity and aviation officer status. Significant differences were observed on ten of the sixteen ICD categories. Diagnoses were not more common among USAF repatriates for any of these ten categories, suggesting the possible impact of group differences with respect to number of REMC examinations. Although a similar explanation may explain the fact that officers were more likely to have received seven of the sixteen categorical diagnoses than enlisted (with enlisted more likely only for mental disorders – PTSD), this finding may also relate to group differences with respect to age, length of captivity and torture severity. The more stringent medical standards associated with aviation duty did not reduce the likelihood

of categorical diagnosis. These interpretations were supported at the specific diagnosis level, where PTSD and lower limb mononeuritis were the only instances where USA repatriates were consistently more likely to have been diagnosed within the follow-up period. For six of the 21 diagnoses, the younger Army repatriates were consistently less likely to have received diagnoses than members of the other repatriate groups.

The hypothesis regarding the prevalence differences between of Vietnam repatriates and WWII/Korean War repatriates was not supported despite the longer duration of their captivity among the Vietnam repatriates. When evaluating prevalence differences among the groups (WWI/Korean repatriates, WWII/Korean controls, Vietnam repatriates and Vietnam controls) we found no differences on five of the sixteen ICD categories. Disorders of the endocrine, special senses, circulatory, skin and musculoskeletal systems were equally common. Cohort differences (where repatriates and controls from one era differed from the other era) were found on ten of the sixteen ICD categories. Unique differences were found for respiratory disorders where the Vietnam CG had the highest prevalence due to screening pulmonary function testing as mentioned above. On five of the ICD categories the Vietnam era patients had a lower prevalence than the WWII/Korean subjects, while they exhibited a higher prevalence on the other five ICD categories where cohort differences were observed. Infectious diseases, mental disorders, digestive disease, ill-defined conditions were more prevalent in the WWII/Korean cohorts, while neoplasms and disorders of the blood, neurological, genitourinary disorders, as well as congenital conditions were more prevalent in the patients from the Vietnam era. Neurotic mental disorders (e.g. PTSD was the only ICD category that demonstrated the effects of captivity and cohort differences. Repatriates from both WWII/Korea and Vietnam exhibited a higher prevalence of neurosis (e.g. PTSD) than did the comparison subjects from their era. Although the effects of specific risk factors on these cohorts will require additional investigation, Vietnam repatriates with higher dispositional optimism have a lower risk of psychiatric illness and better long-term physical and psychological health than repatriates who are more pessimistic.

Our study was not without limitations. As a clinical program, as opposed to a carefully designed epidemiological study, there were various issues that were beyond our control. With regards to the morbidity data, many diagnoses were made elsewhere by either private practitioners and /or clinicians employed by the Veterans Administration. In some cases diagnostic criteria may have been strictly employed while in others diagnoses may have reflected the clinician's most parsimonious explanation of disparate signs, symptoms and laboratory results. We have "severity" information on only a few of our patients and do not routinely annotate diagnosis with qualifiers such as "in remission" or "controlled by medications. Different group accession dates and attrition resulted in a variable number of evaluations per patient and some eligible patients have never taken advantage of this voluntary program. For those Navy/USMC patients who have participated since the program's inception, the number of diagnoses may be inflated. This would include those conditions that evolve over time, as well as those diagnoses that reflected a more in depth evaluation due to the patient's aviation status (e.g., special senses and respiratory conditions associated with annual routine pulmonary function tests). In addition, some patients may have elected to discontinue participation for reasons other than personal health (e.g., poor spousal health or adequate care from their primary care provider), while others may be too ill to travel due to disabling conditions that are unknown to us at this time. Finally, it must be noted that the mortality data reflected only date of death and not cause of death.

In summary, the forty-two year mortality was much lower than expected with no difference between repatriates and comparison group members. Age at time of capture was the only significant predictor of mortality rate. Within the Vietnam repatriates, age also appeared to be a significant predictor of morbidity and the most prominent group difference was associated with PTSD, which was also prominent among repatriates from WWII and Korea. Future research will analyze the ability of age at capture, length of captivity, length of solitary confinement, torture severity and captivity-related medical problems to predict long-term physical and psychological disorders.

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Table 1
Demographics

| | CG | USN/USMC | USAF | USA | O/H |
|-----------|---------|----------|---------|--------|---------|
| Age_TOC | 30.9 | 29.4 | 30.7 | 25.0 | 29.8 |
| LOC | --- | 58.6 | 54.1 | 34.8 | 55.0 |
| LOS | --- | 46.8 | 28.9 | 29.5 | 30.0 |
| Torture | --- | | | | 30.1 |
| % Officer | 100 | 96 | 98 | 34 | 88 |
| | n = 123 | n = 169 | n = 251 | n = 65 | n = 566 |

Table 2
Survival Rates

| Years | CG | USN/USMC | USAF | USA | Non-OH |
|---------|---------|----------|---------|--------|--------|
| 1973-77 | 0.98 | 0.98 | 0.99 | 1.00 | 0.97 |
| 1978-82 | 0.98 | 0.97 | 0.99 | 0.99 | 0.94 |
| 1983-87 | 0.95 | 0.95 | 0.98 | 0.99 | 0.93 |
| 1988-92 | 0.93 | 0.94 | 0.98 | 0.97 | 0.91 |
| 1993-97 | 0.91 | 0.93 | 0.94 | 0.95 | 0.89 |
| 1998-02 | 0.86 | 0.91 | 0.91 | 0.90 | 0.83 |
| 2003-07 | 0.80 | 0.85 | 0.87 | 0.87 | 0.79 |
| 2008-12 | 0.75 | 0.80 | 0.80 | 0.81 | 0.77 |
| 2013-15 | 0.70 | 0.71 | 0.73 | 0.75 | 0.71 |
| | n = 138 | n = 164 | n = 325 | n = 77 | n = 96 |

Table 3
Survival Among USN Matched PAIRS

| | | RPW | | |
|----|----------|----------|-------|-----|
| | | Deceased | Alive | |
| CG | Deceased | 16 | 25 | 41 |
| | Alive | 25 | 72 | 97 |
| | | 41 | 97 | 138 |

Table 4**42-Year Mortality Data for OH Repatriates**

Simultaneous Cox Regression (n = 566)

| | | |
|----------|-----|------|
| Event | 158 | 0.28 |
| Censored | 408 | 0.72 |
| Total | 566 | |

Overall χ^2 71.716 with df = 4; p < 0.001Change χ^2 67.360 with df = 4; p < 0.001 (from previous block)

| Variables in Equation | 95% CI for Exp(B) | | | | | |
|-----------------------|-------------------|--------|--------|--------|-------|-------|
| | B | Wald | p | Exp(B) | lower | upper |
| Age_TOC | 0.106 | 55.305 | < .001 | 1.112 | 1.082 | 1.144 |
| LOC_mnth | 0.004 | 1.294 | 0.255 | 1.004 | 0.997 | 1.01 |
| LOS_wks | 0.000 | 0.001 | 0.981 | 1.000 | 0.997 | 1.003 |
| Torture | 0.002 | 0.082 | 0.775 | 1.002 | 0.988 | 1.016 |

| Table 5a | | | | | | | | | |
|--|----------|------|---------------------------------------|------|---------------------|--|------|------|----------|
| COMPARISON GROUP (n = 123) | | | | | USAF RPWs (n = 251) | | | | |
| USN/USMC RPWs (n = 169) | | | | | USA RPWs (n = 65) | | | | |
| Diagnosis | ICD | % | Diagnosis | ICD | % | Diagnosis | ICD | % | ICD |
| INF | | | | | | | | | |
| 1 Dermatomyositis | 110 | 43.1 | 1 Other Intestinal Helminthiasis | 127 | 24.3 | 1 Dermatomyositis | 110 | 21.1 | 110 |
| 2 Other diseases due to viruses | 78 | 8.1 | 2 Dermatomyositis | 110 | 20.1 | 2 Primary Tuberculous infections | 84 | 4.0 | 84 |
| 3 Herpes Simplex | 54 | 5.7 | 3 Other diseases due to viruses | 78 | 8.3 | 3 Plague | 20 | 2.4 | 20 |
| 4 Herpes Zoster | 53 | 4.9 | 4 Herpes Simplex | 54 | 6.5 | 4 Tuberculosis of meninges or CNS | 13 | 2.4 | 13 |
| 5 Other Salmonella infections | 3 | 4.9 | 5 Other Intestinal Infections | 8 | 6.5 | 5 Tuberculosis due to viruses | 78 | 1.6 | 78 |
| NEO | | | | | | | | | |
| 1 Benign Skin Neoplasms | 216 | 28.5 | 1 Benign Skin Neoplasms | 216 | 21.3 | 1 Benign Skin Neoplasms | 216 | 14.3 | 185 |
| 2 Other Benign Digestive Neoplasms | 211 | 17.9 | 2 Benign neoplasm other digestive | 211 | 19.5 | 2 Skin carcinoma in situ | 232 | 12.0 | 232 |
| 3 Malignant neoplasms of testis | 186 | 15.4 | 3 Malignant neoplasm of prostate | 185 | 11.8 | 3 Malignant skin melanoma | 172 | 11.6 | 172 |
| 4 Other malignant skin neoplasms | 173 | 13.0 | 4 Neoplasm of unspecified nature | 239 | 10.1 | 4 Other malignant skin neoplasms | 173 | 9.2 | 173 |
| 5 Neoplasms of unspecified nature | 239 | 10.6 | 5 Lipoma | 214 | 9.5 | 5 four diagnoses tied at 3.1% | * | 3.1 | * |
| END | | | | | | | | | |
| 1 Disorders of lipid metabolism | 272 | 83.7 | 1 Disorders of lipid metabolism | 272 | 92.9 | 1 Disorders of lipid metabolism | 272 | 82.9 | 272 |
| 2 Obesity | 278 | 27.6 | 2 Thiamine/niacin deficiency states | 265 | 19.5 | 2 Thiamine & Niacin deficiency | 265 | 16.7 | 265 |
| 3 Unspecified metabolism disorders | 277 | 13.8 | 3 Unspecified metabolism disorders | 277 | 18.3 | 3 Diabetes Mellitus | 250 | 14.3 | 250 |
| 4 Acquired Hypothyroidism | 244 | 11.4 | 4 Obesity | 278 | 14.8 | 4 Obesity | 278 | 12.4 | 278 |
| 5 Diabetes Mellitus | 250 | 10.6 | 5 Diabetes Mellitus | 250 | 11.2 | 5 Gout | 274 | 8.4 | 274 |
| BLO | | | | | | | | | |
| 1 Diseases of white blood cells | 288 | 17.1 | 1 Diseases of white blood cells | 288 | 26.0 | 1 Diseases of white blood cells | 288 | 8.8 | 288 |
| 2 Other/unspecified anemias | 285 | 9.8 | 2 Other/unspecified anemias | 285 | 8.9 | 2 Hereditary hemolytic anemias | 285 | 6.4 | 285 |
| 3 Other deficiency anemias | 281 | 8.1 | 3 Other deficiency anemias | 281 | 7.7 | 3 Other/unspecified anemias | 285 | 6.0 | 285 |
| 4 Hereditary hemolytic anemias | 282 | 8.1 | 4 Hereditary hemolytic anemias | 282 | 5.9 | 4 Other deficiency anemias | 281 | 5.6 | 281 |
| 5 Purpura/other hemorrhagic | 287 | 5.7 | 5 Other diseases of the blood | 289 | 3.6 | 5 Purpura/other hemorrhagic | 287 | 4.4 | 287 |
| MEN | | | | | | | | | |
| 1 Alcohol Dependence | 303 | 12.2 | 1 PTSD | 309p | 29.0 | 1 PTSD | 309p | 31.9 | 309p |
| 2 Alcohol/tobacco Abuse | 305 | 9.8 | 2 Anxiety Disorders | 300 | 14.8 | 2 Adjustment Disorders | 309a | 11.2 | 309a |
| 3 Anxiety Disorders | 300 | 9.8 | 3 Alcohol/Tobacco Abuse | 305 | 13.6 | 3 Depression, NOS | 296 | 8.8 | 296 |
| 4 Adjustment Disorder | 309a | 8.9 | 4 Mood Disorders | 296 | 13.0 | 4 Mood Disorders | 296 | 7.2 | 311 |
| 5 Mood Disorders | 296 | 8.9 | 5 Depression, NOS | 311 | 9.5 | 5 Anxiety Disorders | 300 | 4.4 | 305 |
| NEU | | | | | | | | | |
| 1 Sleep Apnea | 327 | 21.1 | 1 Mononeuritis, upper limb | 354 | 53.8 | 1 Mononeuritis, upper limb | 354 | 33.5 | 355 |
| 2 Mononeuritis, upper limb | 354 | 11.4 | 2 Mononeuritis, lower limb | 355 | 20.7 | 2 Sleep Apnea | 327 | 27.5 | 356 |
| 3 Mononeuritis, lower limb | 355 | 8.1 | 3 Hereditary Peripher. Neuropathy | 356 | 17.8 | 3 Hereditary Peripher. Neuropathy | 356 | 12.0 | 327 |
| 4 Nerve root & plexus disorders | 353 | 7.3 | 4 Sleep Apnea | 327 | 17.8 | 4 Mononeuritis, lower limb | 355 | 11.6 | 354 |
| 5 Hered Periph Neuropathy, Migraine | 356, 346 | 4.9 | 5 Nerve root & plexus disorders | 353 | 7.7 | 5 Other extrapyramidal diseases | 333 | 10.8 | 346 |
| SEN | | | | | | | | | |
| 1 Disorders of refraction & accomm. | 367 | 97.6 | 1 Disorders of refraction & accomm. | 367 | 92.9 | 1 Hearing Loss | 389 | 91.6 | 367 |
| 2 Hearing Loss | 389 | 95.1 | 2 Hearing Loss | 389 | 90.5 | 2 Disorders of refraction & accomm. | 367 | 88.8 | 389 |
| 3 Cataract | 366 | 63.4 | 3 Cataract | 366 | 67.5 | 3 Cataract | 366 | 57.8 | 366 |
| 4 Corneal Opacity & other corneal dis. | 371 | 44.7 | 4 Other disorders of the ear | 388 | 41.4 | 4 Other disorders of the ear | 388 | 39.8 | 366 |
| 5 Other disorders of the ear | 388 | 39.0 | 5 Corneal Opacity & other corneal dis | 371 | 32.0 | 5 Corneal Opacity & other corneal dis. | 371 | 29.9 | 371 |
| CIR | | | | | | | | | |
| 1 Essential Hypertension | 401 | 58.5 | 1 Essential Hypertension | 401 | 54.4 | 1 Essential Hypertension | 401 | 62.2 | 401 |
| 2 Hemorrhoids | 455 | 53.7 | 2 Hemorrhoids | 455 | 46.2 | 2 Cardiac Dysrhythmias | 427 | 33.9 | 429 |
| 3 Cardiac Dysrhythmias | 427 | 38.2 | 3 Ill-defined Heart Disease | 429 | 30.8 | 3 Ill-defined Heart Disease | 429 | 30.7 | 455 |
| 4 Conduction Disorders | 426 | 26.8 | 4 Cardiac Dysrhythmias | 427 | 26.0 | 4 Hemorrhoids | 455 | 27.5 | 440 |
| 5 Lower Extremity Varicose Veins | 454 | 23.6 | 5 Conduction Disorders | 426 | 23.7 | 5 Conduction Disorders | 426 | 18.7 | 427, 459 |

Table 6a

| Comparison Group Diagnosis | ICD | % | USN/USMC Repatriate Diagnosis | ICD | % |
|--|-----|------|--|------|------|
| 1 Disorders of refraction & accomm. | 367 | 97.6 | 1 Disorders of lipid metabolism | 272 | 92.9 |
| 2 Hearing Loss | 389 | 95.1 | 2 Disorders of refraction & accomm. | 367 | 92.9 |
| 3 Deviated nasal septum | 470 | 86.2 | 3 Hearing Loss | 389 | 90.5 |
| 4 Disorders of lipid metabolism | 272 | 83.7 | 4 Deviated nasal septum | 470 | 78.1 |
| 5 Benign prostate hypertrophy | 600 | 78.0 | 5 Osteoarthritis | 715 | 77.5 |
| 6 Chronic airway obstruction NEC | 496 | 72.4 | 6 Benign prostate hypertrophy | 600 | 71.6 |
| 7 Osteoarthritis | 715 | 69.1 | 7 Nonspecific findings on blood exam | 790 | 68.0 |
| 8 Spondylosis & related disorders | 721 | 67.5 | 8 Cataract | 366 | 67.5 |
| 9 Other dermatoses | 702 | 65.9 | 9 Spondylosis & related disorders | 721 | 67.5 |
| 10 Cataract | 366 | 63.4 | 10 Other dermatoses | 702 | 65.1 |
| 11 Essential Hypertension | 401 | 58.5 | 11 Chronic airway obstruction NEC | 496 | 62.1 |
| 12 Nonspecific findings on blood exam | 790 | 57.7 | 12 Other/unspecified back disorders | 724 | 62.1 |
| 13 Other/unspecified back disorders | 724 | 54.5 | 13 Essential Hypertension | 401 | 54.4 |
| 14 Hemorrhoids | 455 | 53.7 | 14 Mononeuritis, upper limb | 354 | 53.8 |
| 15 Nonspecific results of function tests | 794 | 50.4 | 15 Peripheral enthesopathies | 726 | 53.3 |
| 16 Allergic rhinitis | 477 | 47.2 | 16 Other/unspecified joint disorders | 719 | 47.9 |
| 17 Corneal Opacity & other corneal dis. | 371 | 44.7 | 17 Diseases of esophagus | 530 | 47.3 |
| 18 Dermatophytosis | 110 | 43.1 | 18 Hemorrhoids | 455 | 46.2 |
| 19 Other bone/cartilage disorders | 733 | 43.1 | 19 Nonspecific results of function tests | 794 | 45.6 |
| 20 Other disorders of the ear | 388 | 39.0 | 20 Allergic rhinitis | 477 | 43.8 |
| 21 Cardiac Dysrhythmias | 427 | 38.2 | 21 Other disorders of the ear | 388 | 41.4 |
| 22 Peripheral enthesopathies | 726 | 37.4 | 22 Corneal Opacity & other corneal dis. | 371 | 32.0 |
| 23 Diseases of esophagus | 530 | 35.8 | 23 Chronic sinusitis | 473 | 32.0 |
| 24 Inguinal hernia | 550 | 30.9 | 24 Ill-defined Heart Disease | 429 | 30.8 |
| 25 Symptoms involving cardiac system | 785 | 30.1 | 25 PTSD | 309p | 29.0 |
| 26 Other, nonspecific abnormal findings | 796 | 30.1 | 26 Other disorders of urethra/tract | 599 | 28.4 |
| 27 Benign Skin Neoplasms | 216 | 28.5 | 27 Other, nonspecific abnormal findings | 796 | 28.4 |
| 28 Obesity | 278 | 27.6 | 28 Other respiratory diseases | 519 | 27.8 |
| 29 Other hernia of abdominal cavity | 553 | 27.6 | 29 Other hernia of abdominal cavity | 553 | 27.2 |
| 30 Conduction Disorders | 426 | 26.8 | 30 Diseases of white blood cells | 288 | 26.0 |

Table 6b

| USAF Repatriate Diagnosis | ICD | % | ARMY Repatriate Diagnosis | ICD | % |
|--|------|------|---|------|------|
| 1 Hearing Loss | 389 | 91.6 | 1 Disorders of refraction & accomm. | 367 | 98.5 |
| 2 Disorders of refraction & accomm. | 367 | 88.8 | 2 Hearing Loss | 389 | 89.2 |
| 3 Disorders of lipid metabolism | 272 | 82.9 | 3 Disorders of lipid metabolism | 272 | 76.9 |
| 4 Osteoarthritis | 715 | 73.7 | 4 PTSD | 309p | 67.7 |
| 5 Benign prostate hypertrophy | 600 | 69.3 | 5 Essential Hypertension | 401 | 66.2 |
| 6 Spondylosis & related disorders | 721 | 64.9 | 6 Cataract | 366 | 53.8 |
| 7 Essential Hypertension | 401 | 62.2 | 7 Benign prostate hypertrophy | 600 | 52.3 |
| 8 Other dermatoses | 702 | 58.2 | 8 Osteoarthritis | 715 | 50.8 |
| 9 Cataract | 366 | 57.8 | 9 Other/unspecified back disorders | 724 | 47.7 |
| 10 Other/unspecified back disorders | 724 | 52.2 | 10 Nonspecific findings on blood exam | 790 | 47.7 |
| 11 Nonspecific findings on blood exam | 790 | 52.2 | 11 Other dermatoses | 702 | 44.6 |
| 12 Chronic airway obstruction NEC | 496 | 45.0 | 12 Spondylosis & related disorders | 721 | 44.6 |
| 13 Other bone/cartilage disorders | 733 | 43.8 | 13 Chronic airway obstruction NEC | 496 | 36.9 |
| 14 Diseases of esophagus | 530 | 41.8 | 14 Other bone/cartilage disorders | 733 | 36.9 |
| 15 Other disorders of the ear | 388 | 39.8 | 15 Mononeuritis, lower limb | 355 | 33.8 |
| 16 Intervertebral disc disorders | 722 | 38.6 | 16 Other disorders of the ear | 388 | 33.8 |
| 17 Allergic rhinitis | 477 | 35.5 | 17 Corneal Opacity & other corneal dis. | 371 | 30.8 |
| 18 Cardiac Dysrhythmias | 427 | 33.9 | 18 Diseases of esophagus | 530 | 29.2 |
| 19 Mononeuritis, upper limb | 354 | 33.5 | 19 Thiamine & Niacin deficiency | 265 | 26.2 |
| 20 Nonspecific results of function tests | 794 | 32.3 | 20 Allergic rhinitis | 477 | 26.2 |
| 21 PTSD | 309p | 31.9 | 21 Intervertebral disc disorders | 722 | 24.6 |
| 22 Ill-defined Heart Disease | 429 | 30.7 | 22 Other hernia of abdominal cavity | 553 | 23.1 |
| 23 Corneal Opacity & other corneal dis. | 371 | 29.9 | 23 Diabetes Mellitus | 250 | 21.5 |
| 24 Sleep Apnea | 327 | 27.5 | 24 Obesity | 278 | 20.0 |
| 25 Hemorrhoids | 455 | 27.5 | 25 Hereditary Peripher. Neuropathy | 356 | 20.0 |
| 26 Dermatophytosis | 110 | 21.1 | 26 Dermatophytosis | 110 | 16.9 |
| 27 Inguinal hernia | 550 | 21.1 | 27 Ill-defined Heart Disease | 429 | 16.9 |
| 28 Other hernia of abdominal cavity | 553 | 20.3 | 28 Sleep Apnea | 327 | 16.9 |
| 29 Other disorders of urethra/tract | 599 | 20.3 | 29 General symptoms | 780 | 16.9 |
| 30 Conduction Disorders | 426 | 18.7 | 30 Adjustment Disorders | 309a | 15.4 |

Table 7

| | | ODDS RATIOS | | | | |
|----------|--|--------------|-------------|-------------|---------------|----------------|
| Category | ICD Diagnostic Group (range) | USN(USMC)/CG | ALL RPW/CG | USA/USAF | USA/USN(USMC) | USAF/USN(USMC) |
| INF | Infectious and Parasitic Diseases (001 - 139) | 0.91 | 0.52 | 0.81 | 0.36 | 0.45 |
| NEO | Neoplasms (140 - 239) | 0.69 | 0.42 | 0.42 | 0.24 | 0.56 |
| END | Endocrine, Nutritional, Metabolic and Immunity (240- 279) | 1.61 | 0.70 | 1.12 | 0.36 | 0.32 |
| BLO | Blood and Blood Forming Organs (280 - 289) | 1.20 | 0.75 | 0.84 | 0.40 | 0.48 |
| MEN | Mental (290 - 319) | 2.26 | 2.14 | 3.31 | 2.39 | 0.72 |
| NEU | Nervous System (320 - 359) | 2.93 | 1.97 | 1.17 | 0.65 | 0.56 |
| SEN | Sense Organs (360 - 389) | 0.27 | 0.43 | 2.09 | 3.93 | 1.88 |
| CIR | Circulatory System (390 - 459) | 0.53 | 0.50 | 0.49 | 0.55 | 1.10 |
| RES | Respiratory System (460 - 519) | 0.48 | 0.11 | 0.56 | 0.09 | 0.16 |
| DIG | Digestive System (520 - 579) | 1.13 | 0.84 | 0.61 | 0.44 | 0.71 |
| GEN | Genitourinary System (580 - 629) | 0.55 | 0.40 | 0.45 | 0.35 | 0.77 |
| SKN | Skin and Subcutaneous (680 - 709) | 1.11 | 0.67 | 0.59 | 0.32 | 0.54 |
| MUS | Musculoskeletal System and Connective Tissues (710 - 739) | 1.15 | 0.56 | 0.51 | 0.23 | 0.45 |
| CON | Congenital Anomalies (740 - 759) | 1.28 | 0.87 | 0.46 | 0.28 | 0.60 |
| ILL | Symptoms, Signs and Ill-Defined Conditions (780 - 799) | 0.82 | 0.47 | 0.68 | 0.34 | 0.49 |
| INJ | Injury and Poisoning (800 - 999) | 2.06 | 1.18 | 0.76 | 0.34 | 0.45 |

BOLD = Statistically significant using 95% confidence intervals for each Odds Ratio

| | | PREVALENCE | | | | |
|----------|--|------------|---------|------|------|------|
| Category | ICD Diagnostic Group (range) | CG | ALL RPW | USN | USAF | USA |
| INF | Infectious and Parasitic Diseases (001 - 139) | 0.61 | 0.45 | 0.59 | 0.39 | 0.34 |
| NEO | Neoplasms (140 - 239) | 0.70 | 0.50 | 0.62 | 0.47 | 0.28 |
| END | Endocrine, Nutritional, Metabolic and Immunity (240- 279) | 0.93 | 0.91 | 0.96 | 0.88 | 0.89 |
| BLO | Blood and Blood Forming Organs (280 - 289) | 0.38 | 0.32 | 0.43 | 0.26 | 0.23 |
| MEN | Mental (290 - 319) | 0.31 | 0.49 | 0.50 | 0.42 | 0.71 |
| NEU | Nervous System (320 - 359) | 0.46 | 0.62 | 0.71 | 0.58 | 0.62 |
| SEN | Sense Organs (360 - 389) | 0.99 | 0.98 | 0.97 | 0.98 | 0.99 |
| CIR | Circulatory System (390 - 459) | 0.93 | 0.86 | 0.87 | 0.88 | 0.78 |
| RES | Respiratory System (460 - 519) | 0.97 | 0.76 | 0.93 | 0.70 | 0.57 |
| DIG | Digestive System (520 - 579) | 0.74 | 0.71 | 0.76 | 0.70 | 0.58 |
| GEN | Genitourinary System (580 - 629) | 0.89 | 0.77 | 0.82 | 0.78 | 0.62 |
| SKN | Skin and Subcutaneous (680 - 709) | 0.76 | 0.68 | 0.78 | 0.65 | 0.52 |
| MUS | Musculoskeletal System and Connective Tissues (710 - 739) | 0.96 | 0.93 | 0.96 | 0.92 | 0.86 |
| CON | Congenital Anomalies (740 - 759) | 0.25 | 0.23 | 0.30 | 0.21 | 0.11 |
| ILL | Symptoms, Signs and Ill-Defined Conditions (780 - 799) | 0.91 | 0.83 | 0.89 | 0.80 | 0.74 |
| INJ | Injury and Poisoning (800 - 999) | 0.41 | 0.45 | 0.59 | 0.39 | 0.32 |

Table 8
Vietnam Repatriates: Enlisted versus Officer

| Category | ICD Diagnostic Group (range) | Prevalence | | Odds Ratio |
|----------|--|------------|---------|-------------|
| | | Enlisted | Officer | Enl/Off |
| INF | Infectious and Parasitic Diseases (001 - 139) | 0.52 | 0.66 | 0.56 |
| NEO | Neoplasms (140 - 239) | 0.18 | 0.54 | 0.14 |
| END | Endocrine, Nutritional, Metabolic and Immunity (240- 279) | 0.93 | 0.91 | 1.34 |
| BLO | Blood and Blood Forming Organs (280 - 289) | 0.21 | 0.33 | 0.56 |
| MEN | Mental (290 - 319) | 0.61 | 0.36 | 2.76 |
| NEU | Nervous System (320 - 359) | 0.55 | 0.63 | 0.72 |
| SEN | Sense Organs (360 - 389) | 1.00 | 0.98 | 2.36 |
| CIR | Circulatory System (390 - 459) | 0.80 | 0.87 | 0.60 |
| RES | Respiratory System (460 - 519) | 0.55 | 0.79 | 0.33 |
| DIG | Digestive System (520 - 579) | 0.54 | 0.73 | 0.43 |
| GEN | Genitourinary System (580 - 629) | 0.59 | 0.80 | 0.36 |
| SKN | Skin and Subcutaneous (680 - 709) | 0.50 | 0.70 | 0.43 |
| MUS | Musculoskeletal System and Connective Tissues (710 - 739) | 0.88 | 0.94 | 0.47 |
| CON | Congenital Anomalies (740 - 759) | 0.07 | 0.25 | 0.23 |
| ILL | Symptoms, Signs and Ill-Defined Conditions (780 - 799) | 0.79 | 0.83 | 0.74 |
| INJ | Injury and Poisoning (800 - 999) | 0.25 | 0.47 | 0.73 |

BOLD = Statistically significant using 95% confidence intervals for each Odds Ratio

Table 9

| ICD | Diagnosis | USA/USAF | USA/USN(USMC) | USA/CG | USAF/USN(USMC) | USAF/CG | USN(USMC)/CG |
|------|-----------------------------------|-------------|---------------|--------------|----------------|--------------|--------------|
| 110 | Dermatophytosis | 0.76 | 0.81 | 0.27 | 1.06 | 0.35 | 0.33 |
| 185 | Malignant neoplasm of prostate | 0.64 | 0.62 | 0.46 | 0.97 | 0.72 | 0.74 |
| 250 | Diabetes Mellitus | 1.37 | 2.17 | 2.32 | 1.58 | 1.70 | 1.07 |
| 278 | Obesity | 1.77 | 1.44 | 0.65 | 0.81 | 0.37 | 0.45 |
| 288 | Disease of White Blood Cells | 0.50 | 0.14 | 0.24 | 0.27 | 0.46 | 1.71 |
| 303 | Alcohol Dependence | 4.05 | 1.23 | 0.47 | 0.28 | 0.12 | 0.4 |
| 309p | PTSD | 4.48 | 5.13 | 49.45 | 1.15 | 11.04 | 9.64 |
| 327 | Sleep Apnea | 0.54 | 0.94 | 0.76 | 1.76 | 1.41 | 0.81 |
| 354 | Mononeuritis, Upper Limb | 0.36 | 0.16 | 1.42 | 0.43 | 3.92 | 9.08 |
| 355 | Mononeuritis, Lower Limb | 3.92 | 1.96 | 5.78 | 0.50 | 1.48 | 2.95 |
| 401 | Essential Hypertension | 1.19 | 1.64 | 1.38 | 1.37 | 1.16 | 0.85 |
| 427 | Cardiac Dysrhythmias | 0.27 | 0.4 | 0.23 | 1.46 | 0.83 | 0.57 |
| 477 | Allergic Rhinitis | 0.65 | 0.46 | 0.40 | 0.71 | 0.62 | 0.87 |
| 550 | Inguinal Hernia | 0.25 | 0.21 | 0.15 | 0.84 | 0.60 | 0.72 |
| 562 | Diverticula of Intestine | 0.36 | 0.21 | 0.21 | 0.58 | 0.59 | 1.02 |
| 600 | Benign Prostate Hypertrophy | 0.49 | 0.44 | 0.31 | 0.90 | 0.64 | 0.71 |
| 709 | Other Skin/Subcutaneous Disorders | 0.56 | 0.19 | 0.45 | 0.34 | 0.80 | 2.33 |
| 715 | Osteoarthritis | 0.37 | 0.30 | 0.46 | 0.81 | 1.25 | 1.54 |
| 721 | Spondylosis & Related Disorders | 0.44 | 0.39 | 0.39 | 0.89 | 0.89 | 1.00 |
| 724 | Other /Unspecified Back Disorders | 0.84 | 0.55 | 0.71 | 0.67 | 0.91 | 1.37 |
| 805 | Fracture of Vertebral Column | 0.59 | 0.31 | 0.65 | 0.52 | 1.10 | 2.11 |

BOLD = Statistically significant using 95% confidence intervals for each Odds Ratio

Table 10

| ICD Category | Repatriates (%) | Controls (%) |
|-------------------------------------|------------------------|---------------------|
| Infectious Diseases | 96 - 99 | 94 - 100 |
| Malignant Neoplasms | 9 - 20 | 13 - 22 |
| Benign Neoplasms | 16 - 19 | 14 - 26 |
| Diabetes | 12 - 15 | 11 - 19 |
| Other Endocrine Diseases | 68 - 86 | 51 - 67 |
| Blood Diseases | 7 - 14 | 15 - 30 |
| Psychoses | 16 - 23 | 0 - 11 |
| Neuroses | 89 - 93 | 63 - 84 |
| Diseases of the Nervous System | 18 - 36 | 11 - 19 |
| Diseases of the Sense Organs | 86 - 88 | 78 - 91 |
| Heart Disease | 51 - 62 | 54 - 67 |
| Cerebrovascular Disease | 5 - 12 | 0 - 9 |
| Hypertension/Other Circulatory | 69 - 80 | 67 - 69 |
| Acute Respiratory Disease | 27 - 36 | 24 - 33 |
| Chronic Respiratory Disease | 61 - 68 | 56 - 65 |
| Digestive Disease | 90 - 94 | 82 - 87 |
| Urogenital Disease | 47 - 60 | 33 - 67 |
| Skin Disease | 70 - 80 | 63 - 72 |
| Musculoskeletal Disease | 87 - 94 | 82 - 89 |
| Congenital Conditions | 6 - 8 | 4 |
| Symptoms and Ill-Defined Conditions | 98 - 99 | 94 - 100 |
| Injury and Poisoning | 85 - 92 | 67 - 94 |
| Number of Subjects | 883 | 184 |

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